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First Named Inventor: BORDEN, THOMAS R.

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Title: METHOD OF APPLYING TWO-COMPONENT PAVEMENT MARKINGS AND APPARATUS

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Washington, DC 20231

CERTIFICATE OF MAILING

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*Amber Nicholson*  
Signed by: Amber Nicholson

Dear Sir:

Further to applicant's Supplemental Information Disclosure Statement submitted April 2, 2003, please find enclosed the translation for DE 197 45 567.

Respectfully submitted,

5-1-03  
Date

By: *Carolyn A. Fischer*  
Carolyn A. Fischer, Reg. No.: 39,091  
Telephone No.: (651) 575-3915

Office of Intellectual Property Counsel  
3M Innovative Properties Company  
Facsimile No.: 651-736-3833

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71	Applicant: Zwingenberger, Arthur, Luzern, Switzerland	72 Inventor: same as applicant
74	Agent: Heinz H. Puschmann & Uwe R. Borchert, 80331, Munich	56 Documents Considered in the Evaluation of Patentability: DE 32 27 417 A1 DE 31 29 348 A1 DE 31 22 061 A1 DE 31 03 610 A1 DE 23 39 827 A1

The following information was taken from the documents submitted by the applicant.

Application is submitted according to § 44 German Patent Law

54 Apparatus for Dispensing a Viscous Liquid

57 The invention pertains to an apparatus (10) for dispensing a viscous liquid. The apparatus has a housing (14), a piston (58, 60) which bears upon a container<sup>1</sup> (22, 24) of the viscous liquid, a rotational drive (12) which moves the piston (58, 60) in the direction of a flow channel opening and is affixed in a motor housing (81) separate from the housing (14), a gear unit (68, 70, 72, 76) that translates the rotational drive movement into the translational movement of the piston (58, 60), a flow channel (52) which connects a nozzle (30) with the dispensing opening in the container (22, 24), and a coupling<sup>2</sup> (82) through which the rotational drive (12) can be detached from the gear unit (68, 70, 72, 76).

<sup>1</sup> container: German "Behältnis" also translates to "receptacle", "case".

<sup>2</sup> coupling: German "Kupplung" also translates to "clutch"

## Description

The invention pertains to an apparatus for dispensing a viscous liquid. From DE 31 03 610 A1, an apparatus is noted which contains a drive coupled to a gear unit. Via the gear unit, two piston rods bearing upon two pistons are moved that each bear upon a container of a viscous liquid of a multi-component mass of material. The container is connected to a mixing nozzle at the opposite end of the piston. The containers can each be removed and replaced in the apparatus. A pneumatic piston is actuated via compressed air which again drives a gear unit to which the pistons are attached. This apparatus, described here as hand held, is awfully heavy and, among other things, costly to manufacture because of the required pneumatic seals.

Further, a stationary table top device is known, which contains inside its housing the pistons for dispensing the viscous liquid of the multi-component mass of material, a gearbox, as well as a rotational drive located above the gearbox. The rotational speed of the rotational drive can be controlled by means of a rotary switch located in the housing. The dispensing rate of the mass of material is determined by the rotational speed.

One disadvantageous aspect of such a design is the lacking ability to apply such an apparatus directly at the patient, for example, when an impressioning material for dental applications needs to be dispensed and mixed.

Additionally, the dentist needs two hands to operate this apparatus, one hand for the switch and one for the tray in which the mixed impressioning material is dispensed into. Thus the handling for the dental applications is cumbersome and impractical.

The purpose of the invention is to provide an apparatus for dispensing a viscous liquids that, while avoiding the above mentioned disadvantages, has a flexible application, is easy to handle and is more suitable for a practice office, especially in the dental industry.

The features of patent Claim 1 fulfill this objective.

Further advantageous derivations of the invention are the subject of the sub claims.

The invention has the underlying recognition that separating the drive from the apparatus allows for flexible design and powering possibilities, which improve the handling and expand the application possibilities.

Per the invention, the apparatus for dispensing a viscous liquid has a housing, a piston which bears upon container of the viscous liquid, a rotational drive which moves the piston translationally in the direction of a flow channel opening and is affixed in a motor housing separate from the housing, a gear unit that translates the rotational drive movement into the translational movement of the piston, a flow channel that connects an nozzle and the dispensing opening in the container, and a coupling through which the rotational drive can be detached from the gear unit.

Pursuant to one of the executed designs of the invention, the apparatus is designed to mix and dispense a multi-component mass of material formed from viscous liquids, in which containers are foreseen for at least two of the single components of the multi-component mass of material and the nozzle is part of a static mixer.

In particular, the apparatus has a coupling, especially an ISO-coupling, for dental tool holders and angles. Through this, it is possible to utilize the drive found in any dental practice or laboratory, by attaching the apparatus to it via the coupling. The product thus does not need its own drive motor inside the housing. The apparatus can thus be offered at a substantially lower price.

Pursuant to one of the executed designs of the invention, the rotational axis of the rotational drive is located at an angle to the axis of the translational movement of the piston or to the plane of the two pistons situated next to each other. Through this, a compact, tight assembling design is obtained.

Electric or pneumatic motors on a dental unit<sup>3</sup> are often employed in a dental practice as a rotational drive for tools and angles with drills, burrs and abrasive tools in order to prepare teeth, crowns or the like. Thus the rotational drive gear for the apparatus can preferably be hooked up to an electric or pneumatic motor and a coupling unit for dental tools and angles. Through this, the drives found in the dental industry today can be used for the apparatus without further concern. The motor is part of the dental unit.

Alternatively, the rotational driving gear can hook up to a battery driven motor, for example when there is no dental motor available. Through the coupling unit, the apparatus can be switched from the battery driven motor and a dental motor without further concern, which greatly expands the field of use.

In particular, the battery driven motor is contained in a motor housing designed to also contain the batteries.

In order to have a simple means of controlling the dispensing speed, the motor functions together with a control unit. The control unit contains an actuator, in the form of a foot pedal. The adjustment of the motor rpm's and thus the dispensing speed as well as the turning on and off of the motor is done by the foot, so that the dentist's or dental technician's hands remain free to work on the teeth, crowns or similar.

Pursuant one of the executed designs of the invention, the gear unit contains a shaft located inside the housing with threads and a spur wheel, whereby a female thread attached to the piston is screwed in and the spur wheel is attached to the rotational driving gear.

Thus, preferably, the piston can be decoupled from the shaft.

In order to decouple in a simple way, the female thread is part of a coupling fixture and the female thread covers only a portion of the shaft. The female thread lies against an enlarged hole across from the threads, so that by moving the coupling unit towards the female thread, the coupling unit and the female thread are decoupled from the shaft and the shaft is placed in the hole. Through this, depending on the usage of the apparatus, the pistons can be brought back to their original position, where the maximum travel of the pistons and thus the maximum dispensing movement is ensured for the next usage.

In order to determine a basis position in which the female thread travels into the shaft, at least one spring is part of the design, which presses the female thread with the coupling unit against the shaft.

In particular, a further spring is included which presses the coupling unit attached to the piston in the direction of the opening of the flow channel, which firstly secures the threading of the female thread into the thread of the shaft and secondly allows the fixation of the holders that holds the containers in the housing.

Engaged with the spur wheel is a further spur wheel, which is connected to the opposing piece of the coupling unit for the dental tool holder and angles.

Pursuant to one of the executed designs, a reduction gearing is placed next to the opposing piece of the coupling unit for the dental tools and angles, preferably having a translation of 500 to

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<sup>3</sup> dental unit: The unit in dental office or laboratory typically containing the chair, drills, light and sink.

1 or 1000 to 1. Through this, the high rpm dental motors can be reduced to suitable level for the apparatus.

The apparatus is designed as a hand held unit in order to dispense dental impressioning material directly into the treatment area. The housing is thus designed with a grip, which contains the coupling unit. By designing it as a hand held unit with a rotational drive, the dentist can fully concentrate on the treatment area. He does not need to exert manual force on the pistons, nor does he need to block one hand to position the regulator because the foot pedal can simply accomplish this.

Further advantages and features of the invention can be seen in the following description of several examples of the invention in reference to the drawings:

Fig. 1 shows a perspective view of the apparatus pursuant to an executed design of the invention with the foil bags, front end and static mixer not assembled in the drawing;

Fig. 2 shows a detailed perspective view of the front end, the static mixer and an emptied foil bag;

Fig. 3 shows a perspective view of the apparatus of Fig. 1. when it is ready for use;

Fig. 4 shows a top view of the static mixer, the front end and both foil bags;

Fig. 5 shows a cross-sectional view of the apparatus of Fig. 1;

Fig. 6 shows an enlarged partial view of Fig. 5;

Fig. 7 shows cross-sectional view of the pistons, foil bag, the front end and the static mixer of Fig. 5, whereby the foil bags are partially emptied;

Fig. 8 shows a cross-sectional side view of the apparatus;

Fig 9 shows a back view of the apparatus with a partial cross-section;

Fig. 10 shows a perspective exploded view of the drive parts and pistons of the apparatus of Fig. 1;

Fig. 11 shows a perspective view of the apparatus with an alternate drive;

Fig. 12 shows a perspective view of the housing of the drive shown in Fig. 11;

Fig. 13 shows a perspective view of the various possible combinations of the apparatus;

Fig. 1 shows an apparatus 10 pursuant to the invention depicted as a hand held unit. The apparatus 10 is attached to a detachable electrical rotational drive 12 which functions together with a control unit not depicted. Alternatively, a pneumatic rotating piston air<sup>4</sup> motor can also be used as a rotational drive.

The apparatus 10 has a housing 14, which contains a receptacle 16. The receptacle 16 is comprised of two separated cylindrical chambers 18 and 20, which serve to hold the foil bags 22, 24. A foil bag 22, 24 is closed on both ends with a clamp 26; See Figs. 4 through 7.

Both foil bags 22 and 24 contain components of a multi-component mass of material and are attached to a front end 28. The front end 28 has a static mixer 30 on the opposite end of the foil bags 22, 24, which is firmly integrated into the front end 28 and juts out of the front end 28 in the direction opposite of the foil bags 22, 24. The outer shell 31 of the static mixer 30 is designed to be turnable with respect to the base 29. Through this, for example, a bent nozzle affixed on the

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<sup>4</sup> Rotating piston air motor: technical translation of the German word "Lamellenmotor". Literal translation would be "lamella motor", "disk motor" or "plate motor".

static mixer 30 can be adjusted to the respective position of use. The foil bags 22 and 24, the front end 28, as well as the static mixer 30 form a construction that can be removed and disposed of after use. In following, this construction will be referred to as the disposable unit 32.

The disposable unit 32 is placed into the receptacle 16 such that the foil bags 22 and 24 load into the chambers 18 and 20 and the front end 28 rests on the front side of the receptacle 16.

The disposable unit 32 can be secured in the receptacle 16 through the use of a holder 34.

The holder 34 can be rotated around an axis, which runs perpendicular to the lengthwise axis of the receptacle 16 or respectively the chambers 18 and 20, and has a holder part<sup>5</sup> 36 located under the receptacle 16 as well as over the receptacle 16.

The bottom holder part 36 extends under the receptacle in the lengthwise direction toward the receptacle 16, going beyond the receptacle and partially wrapping around the front end 28 of the disposable unit 32, which is placed in the receptacle 16. See Fig. 3. Through this, the disposable unit 32 is secured in the housing 14 of the apparatus 10.

A bridge<sup>6</sup> 40 is located on the side of the bottom holder part 36 which, when the holder 34 is closed, runs parallel to the receptacle 16 and on each side of it up to the attachment point 42 of the holder 34 and connects the upper holder part 38 to the lower holder part 36. The lower holder part 36 runs from the attachment point 42 in the direction of the disposable unit 32, whereas the upper holder part 38 runs from the attachment point 42 toward the side of the housing 14 opposite of the disposable unit 32.

The holder 34 can be swung about its attachment point 42 back and forth from the closed position – Fig. 3. – which holds the disposable unit 32 in the receptacle 16, into the open position – Fig. 1 -, which releases the disposable unit 32.

In its closed position, the upper holder part 38 lies against upper side of the receptacle 16 and the lower holder part 36 lies against the underside of the receptacle 16.

A T-shaped hole 44 is included in the upper holder part 38. The T-shaped hole 44 is designed for a coupling part 46 and a catch 48, whose function in relation to the drive 12 is further described below.

A catch 48, connected with an end piece 90 – see Fig. 8 and 10 –, is located in front of the coupling part 46. The catch 46 widens toward the bottom. With this, the holder 34 is secured in the closed position. Located parallel to the lengthwise axis of the receptacle 16, is the end piece 90, into which the coupling part 46 is placed in the direction of the disposable unit 32 and loaded with spring tension – spring 74 per Fig. 6 -, so that when the holder 34 is closed, the end piece 90 moves backward against the spring tension through the upper holder part 36<sup>7</sup> over the catch 48 and the coupling piece 46 and when it passes the catch 48 of the hole 44 of the holder 34, the coupling part 46 and the end piece 90 moves forward again with the catch 48. The catch 48 prevents the holder 34 from swinging back into its open position.

After the apparatus 10 has been used, the coupling part 46 and additionally the end piece 90 are pressed backward with the catch 48 against the pressure of the spring, and the catch 48 can be moved through the hole 44 by swinging the holder 34. The disposable unit 32 is released and can exchanged.

Fig. 2 shows a perspective view of a used disposable unit 32.

<sup>5</sup> holder part: direct translation of German "Halterteil"

<sup>6</sup> bridge: other translations of the German "Steg" include "path", "plank"

<sup>7</sup> upper holder part 36: Apparently a typo in the original document here, the upper holder part is actually "38", not "36" as written in this sentence.

Fig. 4 shows a cross sectional view of the disposable unit 32 with filled foil bags 22 and 24. The foil bags 22 and 24 closed at each end with a clamp 26. An open end of the foil bags 22, 24 attaches into the front end 28, whereby there is a collar 50 on the front end 28 for each foil bag 22, 24. The collar 50 matches the shape of the foil bags 22, 24 and is glued, welded or similarly attached to its respective foil bag 22, 24.

For each open end of the foil bags 22, respectively 24, the front end 28 has a chamber like flow channel 52 that connects to the static mixer 30.

For each chamber of the flow channel 52, a grate 54 is located before the static mixer 30 which prevent the loose clamps 26 of the foil bag 22, 24 from entering the static mixer 30.

The grate 54 located at each chamber for the flow channel 52 is designed to be a part of the static mixer 30. The static mixer 30 along the grate 54 is placed in a hole 56 in the front end 28 and is glued to the front end 28. The grate 54 covers the entire cross section of each respective flow channel 52.

The static mixers 30 have various coils and flanks in their flow openings, which allow for a mixing of the components, for example impressioning material for dental uses, which flow from the foil bag 22 and 24 through the flow channel 52 into the static mixer 30. Depending on the type of components, various designs of the static mixer 30 are used. Such static mixers 30 are well known and are thus not described here.

The mixing ratio of both components is 1:1 in the described case. It can also vary, however.

The components of both foil bags 22 and 24 are mixed together inside the static mixer 30, that is to say, the flow channels keep the two components separate until they enter the static mixer 30. For this, a dividing barrier 56 is designed for both flow channels 52.

The receptacle 16 with the two cylindrical chambers 18, 20 is located in the front area of the housing 14 of the apparatus 10. In the back area of the housing 14, there are two piston rods 62 and 64, attached on one end to the respective piston 58, 60. A piston 58, 60 is interpositioned in chamber 18, respectively 20. The piston 58, 60 is movable in the direction towards the opening of the flow channel 52 on the side of the foil bags 22 and 24, parallel to the lengthwise axis of the receptacle 16, see Fig. 5.

The piston 58, 60 is connected via the piston rods 62, 64 and the end piece 90 (which is attached to the piston rods 62, 64 – see Fig. 10 –) to the coupling part 46 with a female thread 66 that is part of the coupling part 46, because, as it was already described, the coupling part 46 is located inside the end piece 90.

The piston 58, 60 is designed in the shape of the free end of the filled foil bag 22, 24, which lies opposite of the front end 28 and completely covers the clamp 26 that closes the foil bag 22, 24. Through this, the clamp 26 is prevented from loosening from the foil bag 22, 24 when the pressure inside the foil bag increases.

A shaft 68 is located in the middle of the housing 14 between the receptacle 16 and the back wall of the housing 67. The shaft 68, in the area of the receptacle 16, has a spur toothed wheel 70 and thread 72 immediately after it, which runs away from the receptacle 16 and is intended for the female thread 66.

A spring 74 exerts pressure in the direction of the foil bags 22, 24 on the piston rods 62, 64 and the end piece 90 together with the catch 48. Through this, the catch 48 is held in the closed position in the holder and the piston 58, 60 is pressed against the foil bags 22, 24 when the disposable unit 32 is placed in the receptacle 16 of the housing 14. In addition, the female thread 66 is pressed against the end of the thread 72.

Fig. 5 and Fig. 6 show the position in which the coupling part 46 and the end piece 90 with the catch 48 are pressed back to open or respectively close the holder 34. As soon as the holder 34 is closed, the spring 74 presses the piston rod 62, 64 in the direction of the front end 28 and the female thread 66 threads onto the thread 72. When the shaft 78 turns the female thread 66, the piston rods 62, 64 as well as the pistons 58 and 60 are moved onto the foil bags 22 and 24 respectively.

A further spur toothed wheel 76 meshes with the spur toothed wheel 70. The further spur toothed wheel 76 is connected to the rotational drive 12, whose rotational axis is positioned at an angle to the translational axis of both pistons 58 and 60, see Fig. 8.

Fig. 8 shows a lengthwise cross-section of the of the apparatus 10, whereby the dividing barrier 56 of the flow channels 52 in front of the static mixer 30 and the dividing barrier of both cylindrical chambers 18 and 20 of the receptacle 16 can been seen.

The further spur toothed wheel 76 is connected with an opposing piece 78 to an ISO coupling 82 for dental work pieces and angles. Other couplings for dental work pieces and angles can be used as well. The opposing piece 78 meshes with an ISO coupling unit 82 for dental work pieces and angles, which is connected to a dental motor 80 of a dental unit. Such dental motors 80 are well known in relation to work pieces, angles, drills, burrs, and polishing tools for dental applications.

Via the coupling 82, the apparatus 10 can be simply and quickly removed from the dental motor 80 which can then be connected to dental work pieces or angles.

The housing 81 of the dental motor 80 as well as the coupling 82 and the part of the housing 14 of the apparatus 10 which juts out below according to Fig. 8, together form a handle with which the apparatus 10 can be brought into the position of use at the patient. A reduction gear unit 83, with reducing capability of 500 or 1000 to 1 is located in the handle, which connects the further spur toothed wheel 76 and the opposing piece 78 of the coupling.

Fig. 9 shows a back view of the apparatus 10 with partial cross-section, whereby the design of the coupling part 46 can be seen more clearly. The coupling part 46 is firmly bedded in the end piece 90, which is connected to the piston rods 62 and 64, and can be moved in the vertical direction against the pressure of the two springs 84.

The female thread 66, which wraps around a portion of the shaft 68, is located in the lower area of the coupling part 46. The springs 84 press the female thread 66 against the shaft 68. A hole 86, larger than the shaft 68, is located on the side of the female thread 66 opposite of the springs 84.

In the position shown in Fig. 9 the female thread 66 is threaded onto the thread 72 of the shaft 68. When the drive 80 turns, the opposing piece 78 and spur toothed wheel are moved via the coupling, which in turn drives the spur toothed wheel 70 and thus the shaft 68. When the shaft turns, the female thread 66 together with the coupling part 46, the connected end piece 90, the piston rods 62 and 64 and the connected pistons 58 and 60, move toward the opening of the flow channel 52 facing the foil bags 22 and 24.

With this, the pressure inside each of the foil bags 22 and 24 increases so much that each clamp 26 on the foil bags 22 and 24 is loosened and the components contained inside the foil bags 22 and 24 are pressed through the flow channel 52 into the static mixer 60 where they are mixed. In this example, the mixed two component mass of material used for dental applications is dispensed via the dispensing tip 88.

After use, the disposable unit 32 is removed from the apparatus 10 in the described manner and a new one, with filled foil bags 22 and 24, is loaded.

In order for the pistons 58 and 60 to have their full travel available when a new disposable unit 32 is loaded, the coupling part 46 is pressed down against the pressure of the springs 84. With this the shaft 68 is positioned inside the hole 86. The coupling part 46 with the piston rods 62 and 64 as well as the pistons 58 and 60 can henceforward travel against the spring 74 toward the back housing wall 67. If the coupling part 46 is let go of, the female thread 66, due to the force of the spring 74 and 84, meshes again with the thread 72 and can once again, by turning of the shaft, move the pistons 58 and 60 against the foil bags 22 and 24.

Fig. 10 shows an exploded perspective view of the individual drive parts. Here it is made clear that firstly the piston rods 62 and 64 fit into the end piece 90, in which the coupling part 46 is located and secondly that the end piece 90 contains the catch 48.

It should be clearly evident that the hole 92 shown in the end piece 90 is larger than the shaft 68.

Fig. 11 and 12 show an alternative drive unit, where the apparatus 10 is depicted in the previously described way. The drive unit 94 contains a battery driven motor located in a motor housing 96, which also contains a coupling connection for work pieces and angles 104. The motor housing 96 is designed to contain batteries. The motor is driven via a switch 98.

A flexible design of the apparatus 10 pursuant to the invention is made clear though Fig. 13. The dental motor 80 of a dental unit is commonly known to be connected to and controlled by a control unit 102, which has a foot pedal. A dental angle workpiece 104 or the apparatus 10 pursuant to the invention can be connected to the coupling 82 of the motor 80. With this apparatus 10, the dentist can apply impressioning materials, composed of two or more curable components, in a simple and sterile manner.

A further advantage can be seen in that the dentist can control the dispensed amount of material through the foot pedal and the motor rpm's, without having to use a dental hand or applying force. The dentist can fully concentrate on dispensing the impressioning material in the treatment area of the patient. Additionally, the dental motor 80 already existing in his practice office is put to better use.

If a dental motor 80 is not available, the battery operated drive unit 94 can be used.

The invention is distinguished by its simple design and broad application possibilities.

#### List of Reference Numbers

- 10 Apparatus
- 12 Rotational Drive
- 14 Housing
- 16 Receptacle
- 18 Left Chamber
- 20 Right Chamber
- 22 Left Foil Bag
- 24 Right Foil Bag
- 26 Clamp
- 28 Front End
- 29 Base
- 30 Static Mixer
- 31 Outer Shell
- 32 Disposable Unit
- 34 Holder

36 Lower Holder Part  
38 Upper Holder Part  
40 Bridge  
42 Attachment Point  
44 Hole  
46 Coupling Part  
48 Catch  
50 Collar  
52 Flow Channel  
54 Grate  
56 Dividing Barrier  
58 Piston  
60 Piston  
62 Piston Rod  
64 Piston Rod  
66 Female thread  
67 Back Housing Wall  
68 Shaft  
70 Spur Toothed Wheel  
76 Further Spur Toothed Wheel.  
78 Opposing Piece  
80 Dental Motor  
82 Coupling Unit  
83 Reducing Gear Unit  
84 Spring  
86 Hole  
88 Dispensing Nozzle  
90 End Piece  
92 Hole  
94 Drive Unit  
96 Motor Housing  
98 Switch  
100 Pedal  
102 Control Unit  
104 Angle Work Piece

#### Patent Claims

1. Apparatus (10) for dispensing a viscous liquid with a housing (14), with a piston (58, 60) which presses against a container (22, 24) containing the viscous liquid, with a rotational drive (12) which moves the piston (58, 60) toward a flow channel which is open to the container (22, 24) and which is connected to a motor housing (81) separate from the housing (14), with a gear unit (68, 70, 72, 76) that translates the rotational drive movement into the translational movement of the piston (58, 60), with a flow channel (52) which connects a nozzle (30) and an dispensing opening to the container (22, 24), and with a coupling (82) by which the rotational drive (12) can be decoupled from the gear unit (68, 70, 72, 76).
2. Apparatus for mixing and dispensing a multi-component mass of material made of a viscous liquid of Claim 1 wherein at least two of the containers (22, 24) which contain the individual

components of the multi-component mass of material are incorporated in the design and the nozzle is part of a static mixer (30).

3. Apparatus of Claim 1 or Claim 2, distinguished by a coupling, especially an ISO-coupling (82), for dental work pieces and angles (104).
4. Apparatus of any of the previous Claims, wherein the rotational axis of the rotational drive (12) is placed at an angle to the axis of the translational movement of a piston or the plane of translational movement of two pistons (58, 60) located next to each other.
5. Apparatus of any of the previous Claims, wherein the rotational drive (12) contains an electric or pneumatic motor and a coupling unit (82) for dental work pieces and angles (104).
6. Apparatus of Claim 5, wherein the rotational drive (12) contains a dental motor (80) of a dental unit<sup>8</sup>.
7. Apparatus of Claim 5, wherein the rotational drive (12) contains a battery driven motor.
8. Apparatus of Claim 7, wherein a motor housing (96) is designed to contain batteries.
9. Apparatus of any of the previous Claims, wherein the motor (80) functions together with a control unit (102).
10. Apparatus of Claim 9, wherein the control unit (102) contains an actuator in the form of a foot pedal (100).
11. Apparatus of any of the previous Claims wherein, the gearing unit contains a shaft (68) with a threaded area (72) and a spur toothed wheel (70), located inside the housing (14), whereby a female thread (66), attached to the piston (58, 60) threads onto the threaded area (72) and the spur toothed wheel (70) is connected to the rotational drive (12).
12. Apparatus of Claim 11, wherein the piston (58, 60) can be decoupled from the shaft (68)
13. Apparatus of Claim 12, wherein the female thread (66) is part of the coupling part (46), the female thread (66) wraps around a portion of the shaft (68) and lays up against a hole (86) enlarged with respect to the thread (72), so that with movement of the coupling part (46) toward the female thread (66), the coupling part and the female thread (66) are decoupled from the shaft (68) and the shaft (68) is positioned in the hole (86).
14. Apparatus of Claim 13, wherein at least one spring (84) is incorporated in the design, which presses the female thread (66) together with the coupling unit (46) against the shaft (68).
15. Apparatus of either Claim 13 or Claim 14, wherein a further spring (74) is incorporated which presses the coupling unit (46), which is attached to the piston (58, 60), toward the opening of the flow channel (52).
16. Apparatus of any of the Claims 11 to 15, wherein a further spur toothed wheel (76) meshes with the spur toothed wheel (70), which is connected to the opposing piece (78) of the coupling unit (82) for dental work pieces and angles (104).
17. Apparatus of any of the previous Claims, wherein a reduction gear unit is attached to the opposing piece (78) of the coupling unit (82) for the dental work pieces and angles (104).
18. Apparatus of Claim 17, wherein the reduction gear unit has a translation of 500 to 1 or 1000 to 1.
19. Apparatus of any of the previous claims wherein it is designed as a hand held unit.

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<sup>8</sup> Dental unit: The unit in dental office or laboratory typically containing the chair, drills, light and sink.

20. Apparatus of Claim 19 wherein the housing (14) is designed with a handle, which contains the opposing piece of the coupling unit (82).
21. Apparatus of either Claim 19 or Claim 20, wherein a portion of the housing (14) and the motor housing (81) is designed as a handle.

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8 Pages of Diagrams Follow  
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